

REMARKS

Claims 14-22 are pending in this application. By this Amendment, claims 10-13 and 23-24 are canceled without prejudice or disclaimer of the subject matter contained therein.

Claims 14-22 are amended. No new matter has been added.

The indication on page 5, item 22 of the Office Action that claims 17-19 contain allowable subject matter and would be allowable if rewritten in independent form is acknowledged. Consequently, claim 17 is rewritten in independent form including all the limitations of the base claim and any intervening claims. Claims 18-19 are amended to depend from claim 17, and are allowable.

Claim 14 is amended into independent form and also amended to include a feature supported on page 15, lines 5-14 and page 18, lines 6-11 of the specification, and Figs 1(e)-1(g). Claim 14 is also amended in form to better recite each step in the method. Claim 20 is amended into independent form and to include a feature supported on page 23, lines 17-23 of the specification.

Claims 15, 18 and 21 are amended to recite the feature of canceled claim 12. Claims 16, 19 and 22 are amended to recite the features of canceled claims 11 and 13.

Further, claims 15-16 are amended to depend from claim 14, and claims 21-22 are amended to depend from claim 20.

An Information Disclosure Statement with Form PTO-1449 was filed in the above-captioned patent application on July 15, 2003. Applicants have not yet received from the Examiner a copy of the Form PTO-1449 initialed to acknowledge the fact that the Examiner has considered the disclosed information. The Examiner is requested to initial and return to the undersigned a copy of the Form PTO-1449. For the convenience of the Examiner, a copy of that form and a copy of the stamped receipt are attached.

For the following reasons, Applicants request the reconsideration of the rejections.

I. Reply to Rejection

A. Section 102(e) Rejections

On page 2, item 16 of the Office Action, claims 1-16 and 23-24 are rejected under 35 U.S.C. §102(e) over U.S. Patent No. 6,265,328 to Henley et al. (hereinafter "Henley"). The rejection of canceled claims 1-13 and 23-24 is moot. The rejection of claims 14-16 is respectfully traversed.

Applicants respectfully submit that Henley fails to disclose a method for producing a bonding wafer comprising forming an oxide film by subjecting the wafer to bonding heat treatment in an oxidizing atmosphere, masking at least portions of the top surface other than peripheral portion to be removed, and the removal of the peripheral portion of the thin film is attained by etching the wafer, as recited in claim 14.

Henley discloses producing SOI wafer by a Smart Cut method, wherein a photomasking process is performed on portions other than the peripheral portion 203 of a thin film 14 formed on a substrate 12, and the peripheral portion of the thin film is removed by etching. However, there is no teaching or suggestion in Henley of forming an oxide film by subjecting the wafer to a bonding heat treatment in an oxidizing gas atmosphere, and the removal of the peripheral portion of the thin film is attained by etching, as recited in claim 14. Henley merely discloses that a photomask 201 is directly formed on the SOI layer 14 as shown in Fig. 1.

For example, as disclosed in Fig. 1 and page 14, line 27 to page 15, line 27 of the specification, after the delamination step, the SOI wafer is subjected to a heat treatment at a high temperature as a bonding heat treatment, for example, at 1050°C to 1200°C for 30 minutes to 2 hours under an oxidizing gas atmosphere, so that its bonding strength can be sufficient before the removal. When the SOI wafer after delamination is subjected to such a bonding heat treatment under an oxidizing gas temperature, the bonding strength is increased, and in addition, an oxide film is formed on a surface of the SOI wafer (top surface of the SOI

layer). After that, the removal of the peripheral portion of the thin film is attained by etching the wafer with masking (by a masking tape, photomask, or the like) the top surface (the oxide film formed on the SOI layer) other than the peripheral portion to be removed. If the bonding heat treatment as described above is performed in advance, the following various advantages can be obtained.

For example, since the SOI layer is masked via the oxide film formed by the bonding heat treatment, there is an advantage that the SOI layer does not suffer contamination which may be caused by masking. Also, since the SOI wafer is subjected to the bonding heat treatment in advance so that the bonding strength between a base wafer and the thin film (oxide film and SOI layer) is enhanced, there is another advantage that only the peripheral portion of the thin film in which the bonding strength is small can be surely removed. Moreover, there is also another advantage that when the masking tape or the like is stripped after the removal of the peripheral portion of the thin film, it can be surely prevented that the SOI layer is delaminated therewith since the bonding strength between the base wafer and the thin film is already enhanced.

As described above, before the removal of the peripheral portion of the thin film, if the wafer is subjected to the bonding heat treatment under an oxidizing gas atmosphere to form an oxide film on the wafer surface (SOI layer), various extremely advantageous effects can be obtained.

Consequently, claim 14 is patentable over the applied reference. Claims 15-16, which depend from claim 14 are also patentable over the applied reference for at least the reasons discussed above and for the additional features they recite. Withdrawal of the rejection of claims 1-16 and 23-24 is respectfully requested.

On page 3, item 17 of the Office Action, claims 10-16, 20 and 23-24 are rejected under 35 U.S.C. §102(e) over U.S. Patent No. 6,417,108 to Akino et al. (hereinafter "Akino").

The rejection of canceled claims 10-13 and 23-24 is moot. The rejection of claims 14-16 and 20 is respectfully traversed.

Applicants respectfully submit that Akino fails to disclose a method for producing a bonding wafer after forming an outside film by subjecting the wafer to bonding heat treatment in an oxidizing atmosphere, masking at least portions of the top surface other than the peripheral portion to be removed, wherein the removal of the peripheral portion of the thin film is attained by etching the wafer, as recited in claim 14.

Applicants also respectfully submit Akino fails to disclose a method for producing a bonding wafer by hydrogen ion delamination method comprising the removal of the peripheral portion of the thin film is attained by polishing only the peripheral portion while supplying pure water to the center of the wafer, as recited in claim 20.

Akino discloses that masking is performed by applying photoresist or tape onto an SOI substrate 5, and periphery of a thin film (insulation film 2 + silicon layer 3) is removed by etching. However, Akino fails to teach or suggest that before the removal of the peripheral portion of the thin film, an oxide film is formed on the surface of the SOI wafer by subjecting the wafer to bonding heat treatment in an oxidizing atmosphere as recited in claim 14. Akino merely discloses that the mask 4 is directly applied onto the SOI layer 3 as shown in Figs. 2-6.

Further, Akino discloses that the peripheral portions of an oxide film 2 and an SOI layer 3 is removed by means of an edge polisher (col. 7, lines 15-17; col. 11, lines 51-65). However, Akino fails to teach or suggest that the removal of the peripheral portion of the thin film is attained by polishing only the peripheral portion while supplying pure water to the center of the wafer, as recited in claim 20.

Consequently, claims 14 and 20 are patentable over the applied reference. Claims 15-16, which depend from claim 14 are also patentable over the applied reference for at least

the reasons discussed above and for the additional features they recite. Withdrawal of the rejection of claims 10-16, 20 and 23-24 is respectfully requested.

B. 103 Rejections

On page 4, item 20 of the Office Action, claims 21-22 are rejected under 35 U.S.C. §103(a) over Akino. The rejection is respectfully traversed.

As discussed above for the §102(e) rejection of claim 20, Akino fails to disclose that the removal of the peripheral portion of the thin film is attained by polishing only the peripheral portion while supplying pure water to the center of the wafer.

Claim 20 recites that the removal of the peripheral portion of the thin film is attained by polishing only the peripheral portion while supplying pure water to the center of the wafer. As described on page 23, lines 13-23 of the specification, when polishing the peripheral portion to remove it, if the polishing is performed while supplying pure water to the center of the wafer, the polishing agent can be prevented from contacting with portions other than the peripheral portion. Accordingly, portions other than the peripheral portion of the SOI layer can be prevented from the action of etching caused by a polishing agent, and only the peripheral portion of the thin film can be surely removed.

Consequently, claim 20 is patentable over Akino and claims 21-22, which depend from claim 20, are likewise patentable over the applied reference for at least the reasons discussed above and for the additional features they recite. Withdrawal of the rejection of claims 21 and 22 is respectfully requested.

On page 5, item 21 of the Office Action, claims 20-22 are rejected under 35 U.S.C. §103(a) over Henley. The rejection is respectfully traversed.

Applicants respectfully submit that Henley fails to disclose that the removal of the peripheral portion of the thin film is attained by polishing only the peripheral portion while supplying pure water to the center of the wafer, as recited in claim 20.

Henley discloses that the removal of the peripheral portion of the thin film is attained with supplying an etchant to the peripheral portion, but fails to teach or suggest that the removal is attained by polishing the peripheral portion while supplying pure water to the center of the wafer. At most, Henley discloses that the edge region is removed by etching of fluid ejected from an ablation tool such as an orifice, and at the same time, a protecting liquid is dispensed in a center region of the wafer while the wafer rotates (col. 9, lines 6-7; lines 18-35 and Fig. 4). However, there is no mention of polishing the edge region and supplying a pure water.

Consequently, claim 20 is patentable over the applied reference. Claims 21-22 are also patentable over the applied reference for at least the reasons discussed above and for the additional features they recite. Withdrawal of the rejection of claims 20-22 is respectfully requested.

II. Conclusion

For the reasons stated above, Applicants submit that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 14-16 and 20-22, as well as the allowance of claims 17-19 are respectfully requested.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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WPB:SSK/jcp

Attachments:

PTO-1449

Stamped receipt

Date: November 18, 2003

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